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13/96

# Mendip District Local Plan
# Wells

## Agricultural Land Classification
## July 1996

Resource Planning Team
Taunton Statutory Group
ADAS Bristol

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Ministry of Agriculture Fisheries and Food
Land Use Planning Unit

**MENDIP LOCAL PLAN WELLS**

**AGRICULTURAL LAND CLASSIFICATION SURVEY**

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# MENDIP LOCAL PLAN WELLS

# AGRICULTURAL LAND CLASSIFICATION SURVEY

## INTRODUCTION

1 This report presents the findings of a semi detailed Agricultural Land Classification (ALC) survey of 458 7 ha of land in two sites at Wells Somerset Field survey was based on 233 auger borings and 11 soil profile pits and was completed in June 1996

2 The survey was conducted by the Resource Planning Team of ADAS Taunton Statutory Group on behalf of MAFF Land Use Planning Unit in its statutory role in the preparation of Mendip Local Plan

3 Information on climate geology and soils, and from previous ALC surveys was considered and is presented in the relevant section Apart from the published regional ALC map (MAFF 1977) which shows the sites at a reconnaissance scale as mainly grade 3 but with large areas of both grade 2 and grade 4 to the South of the town, the site was previously surveyed in 1982 at a scale of 1 10 000 (ADAS 1982) The 1982 survey was less intensive than the current survey and was also carried out to the previous guidelines which are now superseded It shows a fairly even distribution of ALC grades from Grade 2 to Subgrade 3c mainly Subgrades 3a and 3b However the current survey uses the Revised Guidelines and Criteria for grading the quality of agricultural land (MAFF 1988) and supersedes any previous ALC survey Grade descriptions are summarised in Appendix I

4 At the time of survey land cover was mainly ley and permanent grass for dairying, with the occasional field in maize or potatoes Other land which was not surveyed included residential and commercial land, roads woodland the sewage works and a golf course

## SUMMARY

5 The distribution of ALC grades is shown on the accompanying 1 20 000 scale ALC map The detail of information shown at this scale is appropriate to the intensity of field survey but could be misleading if enlarged or applied to small areas Areas are summarised in the Table 1

**Table 1 Distribution of ALC grades Wells**

| Grade | Area (ha) | % Surveyed Area (353 7 ha) |
|---|---|---|
| 3a | 44 8 | 12 6 |
| 3b | 171 1 | 48 4 |
| 4 | 137 8 | 39 0 |
| Other land | 105 0 | |
| Total site area | 458 7 | |

6 Only 12 6% of the surveyed area was found to be best and most versatile This was Subgrade 3a with moderáte limitations mainly due to workability although other limitations may be found

7 The remainder of the site was found to be Subgrade 3b with more serious moderate limitations due to wetness and workability and grade 4 with severe limitations mainly due to wetness This whole area of Subgrade 3b found on limestone in the Eastern site was limited mainly by droughtiness

## CLIMATE

8 Estimates of climatic variables for this site were derived from the published agricultural climate dataset "Climatological Data for Agricultural Land Classification" (Meteorological Office 1989) using standard interpolation procedures Data for key points around the site are given in Table 2 below

9 Since the ALC grade of land is determined by the most limiting factor present, overall climate is considered first because it can have an overriding influence by restricting land to a lower grade despite more favourable site and soil conditions Parameters used for assessing overall climate are accumulated temperature a measure of relative warmth and average annual rainfall, a measure of overall wetness The results shown in Table 2 indicate that there is an overall climatic limitation which limits the land to Grade 2 in the extreme northern corner of the eastern site Otherwise there is no overall climatic limitation.

10 Climatic variables also affect ALC grade through interactions with soil conditions The most important interactive variables are Field Capacity Days (FCD) which are used in assessing soil wetness and potential Moisture Deficits calculated for wheat and potatoes, which are compared with the moisture available in each profile in assessing soil droughtiness limitations These are described in later sections A critical boundary of 200 FC Days was found in the area of the golf course at around 80m altitude

**Table 2 Climatic Interpolations Wells**

| Grid Reference | | ST530455 | ST567462 | ST57346 |
|---|---|---|---|---|
| Altitude (m) | | 40 | 80 | 145 |
| Accumulated Temperature (day °C) | | 1517 | 1470 | 1396 |
| Average Annual Rainfall (mm) | | 854 | 914 | 972 |
| Overall Climatic Grade | | 1 | 1 | 2 |
| Field Capacity Days | | 190 | 200 | 208 |
| Moisture deficit (mm) | Wheat | 101 | 92 | 80 |
| | Potatoes | 92 | 81 | 60 |

## RELIEF

11 Altitude ranges from 30 metres at the River Sheppey in the south of the site to 145 metres north of the Mendip Hospital in the eastern site Slopes are mainly gentle to moderate and not limiting, although small areas of strongly sloping land (8-11°) do occur on the slopes of Tor Hill overlooking Palace Farm and to the east of Mendip Hospital

## GEOLOGY AND SOILS

12 The underlying geology of the site is shown on the published geology map (IGS 1963) as mainly Keuper Marl in the main site with patches of river terrace gravel, alluvium and other head, particularly in the river valleys The eastern site is shown to be mainly Dolomitic conglomerate with small areas of various Carboniferous limestone on the higher ground This distribution was largely borne out by the current ALC Survey although the occurence of gravel head and alluvium, which is critical to ALC grading, was found to be somewhat more variable than indicated by the published information

13 Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1 250 000 (SSEW 1983) as mainly Whimple 1 association on the main site with smaller areas of Worcester Crwbin and Ston Easton associations on the Eastern site Whimple 1 association is described as slowly permeable non-calcareous and calcareous reddish clay soils over mudstone shallow on steeper slopes

14 More detailed soils information is also shown on the 1 63 360 scale survey of Wells, Sheet 280 (SSEW 1968) This shows the distribution of soil series as defined at that time with mainly Worcester Spetchley and Max series on the Keuper Marl with Langford and Compton series on the head and alluvium Small areas of Wrington, Lulsgate and Evesham series are found on the limestone deposits in the eastern site

15 The published distribution of soil associations and series was largely borne out by the current ALC survey

## AGRICULTURAL LAND CLASSIFICATION

16 The distribution of ALC grades found by the current survey is shown on the accompanying 1 20 000 scale map and areas are summarised in Table 1 The detail of information shown at this scale is appropriate to the intensity of field survey but could be misleading if enlarged or applied to small areas

### Subgrade 3a

17 The several areas shown as Subgrade 3a were found to be limited by a moderate limitation of restricted workability This occurs on the red Keuper Marl where heavy clay loam or heavy silty clay loam topsoil textures are found with no evidence of wetness (Wetness Class I) The absence of a wetness limitation is illustrated by Pits 4 and 7 where although the structural and porosity characteristics for a slowly permeable layer may have been present, there was considered to be insufficient evidence of wetness with less than 2% manganese concretions and no gleying evident

18 Pit 8 illustrates similar conditions of wetness and topsoil texture, but on gravel head over Keuper Marl, where even stone contents of 28 to 64% in the subsoil do not lead to an overriding droughtiness limitation

19 The area shown as Subgrade 3a in the eastern site is known to be variable with assessments based on auger boring observations ranging from Grade 2 to Subgrade 3b even one isolated boring of Grade 4 However the overall assessment as Subgrade 3a with a primary limitation due to workability is considered to be fair for the area as a whole at semi-detailed intensity of survey and for mapping at the scale shown

**Subgrade 3b**

20 Soils in this more extensive mapping unit were found to have more serious moderate limitations mainly due to workability and wetness Where clay or silty clay topsoil textures are found at Wetness Class I, as described above the primary limitation is due to workability

21 However where there is more conclusive evidence of wetness, either common manganese concretions or gleying in at least one horizon, the presence of an SPL has been inferred if the other requirements of structure and restricted porosity are met In this mapping unit, any slowly permeable layer was generally found to start in the lower subsoil, typically 55-65cm, (Wetness Class III) This combined with heavy clay loam or heavy silty clay loam topsoil texture indicates Subgrade 3b with a more serious moderate limitation due to wetness

22 The small area of Subgrade 3b in the eastern site was found to have a more serious moderate limitation due to droughtiness This is illustrated by Pits 12 and 13

**Grade 4**

23 The areas shown as Grade 4 have a severe limitation, mainly due to wetness Although all profiles are developed on native Keuper Marl and show either Wetness Class III with clay or silty clay topsoil textures or Wetness Class IV with heavy clay loam or heavy silty clay loam topsoil textures, not all are the same

24 Profiles which are predominantly grey with extensive gleying and with obviously poor structure are found around the sewage works and to the north of Park Wood These are illustrated by Pit 9

25 However other profiles are developed on red native Keuper Marl and have retained predominantly red or red brown colours throughout Where the occurrence of a slowly permeable layer is established by reference to the defined structural and porosity characteristics in the presence of evidence of wetness the Wetness Class is deduced by reference to topsoil texture This leads to the classification of large areas on the site as Grade 4 particularly between Park Wood and the River Sheppey and to the east of Gypsy Lane Profiles within these areas are believed to exhibit the characteristics of a slowly permeable layer including evidence of wetness despite the appearance of highly productive grassland

**Other Land**

26 It should be noted that the sewage works was not surveyed as it was considered to be primarily urban overall, being enclosed by a chainlink security fence However it does contain small areas of land which are apparantly still in agricultural use as they were being cut by forage harvester at the time of survey

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17 June 1996

## REFERENCES


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## APPENDIX I

## DESCRIPTION OF GRADES AND SUBGRADES

### Grade 1 - excellent quality agricultural land

Land with no or very minor limitations to agricultural use A very wide range of agricultural and horticultural crops can be grown and commonly include top fruit, soft fruit, salad crops and winter harvested vegetables Yields are high and less variable than on land of lower quality

### Grade 2 - very good quality agricultural land

Land with minor limitations which affect crop yield, cultivation or harvesting A wide range of agricultural and horticultural crops can usually be grown but on some land in the grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable root crops The level of yield is generally high but may be lower or more variable than Grade 1

### Grade 3 - good to moderate quality agricultural land

Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2

#### Subgrade 3a good quality agricultural land

Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape potatoes, sugar beet and the less demanding horticultural crops

#### Subgrade 3b - moderate quality agricultural land

Land capable of producing moderate yields of a narrow range of crops principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year

### Grade 4 - poor quality agricultural land

Land with severe limitations which significantly restrict the range of crops and/or level of yields It is mainly suited to grass with occasional arable crops (e g cereals and forage crops) the yields of which are variable In most climates yields of grass may be moderate to high but there may be difficulties in utilisation The grade also includes very droughty arable land

**Grade 5 - very poor quality agricultural land**

Land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops

**Source** MAFF (1988) Agricultural Land Classification of England and Wales Revised Guidelines and Criteria for Grading the Quality of Agricultural Land, MAFF Publications, Alnwick.

## APPENDIX II

## DEFINITION OF SOIL WETNESS CLASSES

Soil wetness is classified according to the depth and duration of waterlogging in the soil profile

**Wetness Class I**

The soil profile is not wet within 70 cm depth for more than 30 days in most years

**Wetness Class II**

The soil profile is wet within 70 cm depth for 31 90 days in most years or if there is no slowly permeable layer within 80 cm depth, it is wet within 70 cm for more than 90 days, but not wet within 40 cm depth for more than 30 days in most years

**Wetness Class III**

The soil profile is wet within 70 cm depth for 91 180 days in most years or if there is no slowly permeable layer within 80 cm depth, it is wet within 70 cm for more than 180 days, but only wet within 40 cm depth for between 31 and 90 days in most years

**Wetness Class IV**

The soil profile is wet within 70 cm depth for more than 180 days but not within 40 cm depth for more than 210 days in most years or if there is no slowly permeable layer within 80 cm depth, it is wet within 40 cm depth for 91 210 days in most years

**Wetness Class V**

The soil profile is wet within 40 cm depth for 211 335 days in most years

**Wetness Class VI**

The soil profile is wet within 40 cm depth for more than 335 days in most years

**Notes** The number of days specified is not necessarily a continuous period

'In most years is defined as more than 10 out of 20 years

**Source** Hodgson, J M (In preparation) Soil Survey Field Handbook, Revised Edition

## APPENDIX III

## ABBREVIATIONS AND TERMS USED IN SURVEY DATA

Soil pit and auger boring information collected during ALC survey is held on a computer database and is reproduced in this report Terms used and abbreviations are set out below These conform to definitions contained in the Soil Survey Field Handbook (Hodgson, 1974)

**1 Terms used on computer database, in order of occurrence.**

**GRID REF** National 100 km grid square and 8 figure grid reference

**LAND USE** At the time of survey

| | | | | | |
|---|---|---|---|---|---|
| **WHT** | Wheat | **SBT** | Sugar Beet | **HTH** | Heathland |
| **BAR.** | Barley | **BRA** | Brassicas | **BOG** | Bog or Marsh |
| **OAT** | Oats | **FCD** | Fodder Crops | **DCW** | Deciduous Wood |
| **CER.** | Cereals | **FRT** | Soft and Top Fruit | **CFW** | Coniferous Woodland |
| **MZE** | Maize | **HRT** | Horticultural Crops | **PLO** | Ploughed |
| **OSR.** | Oilseed Rape | **LEY** | Ley Grass | **FLW** | Fallow (inc Set aside) |
| **POT** | Potatoes | **PGR.** | Permanent Pasture | **SAS** | Set Aside (where known) |
| **LIN** | Linseed | **RGR.** | Rough Grazing | **OTH** | Other |
| **BEN** | Field Beans | **SCR.** | Scrub | | |

**GRDNT** Gradient as estimated or measured by hand held optical clinometer

**GLEY, SPL** Depth in centimetres to gleying or slowly permeable layer

**AP (WHEAT/POTS)** Crop-adjusted available water capacity

**MB (WHEAT/POTS)** Moisture Balance (Crop adjusted AP - crop potential MD)

**DRT** Best grade according to soil droughtiness

If any of the following factors are considered significant, Y will be entered in the relevant column

| | | | | | |
|---|---|---|---|---|---|
| **MREL** | Microrelief limitation | **FLOOD** | Flood risk | **EROSN** | Soil erosion risk |
| **EXP** | Exposure limitation | **FROST** | Frost prone | **DIST** | Disturbed land |
| **CHEM** | Chemical limitation | | | | |

**LIMIT** The main limitation to land quality The following abbreviations are used

| | | | | | |
|---|---|---|---|---|---|
| **OC** | Overall Climate | **AE** | Aspect | **EX** | Exposure |
| **FR.** | Frost Risk | **GR.** | Gradient | **MR.** | Microrelief |
| **FL** | Flood Risk | **TX** | Topsoil Texture | **DP** | Soil Depth |
| **CH** | Chemical | **WE** | Wetness | **WK** | Workability |
| **DR.** | Drought | **ER.** | Erosion Risk | **WD** | Soil Wetness/Droughtiness |
| **ST** | Topsoil Stoniness | | | | |

**TEXTURE** Soil texture classes are denoted by the following abbreviations

| | | | | | |
|---|---|---|---|---|---|
| **S** | Sand | **LS** | Loamy Sand | **SL** | Sandy Loam |
| **SZL** | Sandy Silt Loam | **CL** | Clay Loam | **ZCL** | Silty Clay Loam |
| **ZL** | Silt Loam | **SCL** | Sandy Clay Loam | **C** | Clay |
| **SC** | Sandy clay | **ZC** | Silty clay | **OL** | Organic Loam |
| **P** | Peat | **SP** | Sandy Peat | **LP** | Loamy Peat |
| **PL** | Peaty Loam | **PS** | Peaty Sand | **MZ** | Marine Light Silts |

For the sand, loamy sand sandy loam and sandy silt loam classes, the predominant size of sand fraction will be indicated by the use of the following prefixes

**F** Fine (more than 66% of the sand less than 0 2mm)
**M** Medium (less than 66% fine sand and less than 33% coarse sand)
**C** Coarse (more than 33% of the sand larger than 0 6mm)

The clay loam and silty clay loam classes will be sub-divided according to the clay content **M** Medium (< 27% clay) **H** heavy (27 35% clay)

**MOTTLE COL** Mottle colour using Munsell notation
**MOTTLE ABUN** Mottle abundance expressed as a percentage of the matrix or surface described

**F** few <2% **C** common 2 - 20% **M** many 20 - 40% **VM** very many 40%+

**MOTTLE CONT** Mottle contrast

**F** faint indistinct mottles, evident only on close inspection
**D** distinct mottles are readily seen
**P** Prominent mottling is conspicuous and one of the outstanding features of the horizon

**PED COL** Ped face colour using Munsell notation

**GLEY** If the soil horizon is gleyed a Y will appear in this column If slightly gleyed an S will appear

**STONE LITH** Stone Lithology One of the following is used

| | | | |
|---|---|---|---|
| **HR.** | All hard rocks and stones | **SLST** | Soft oolitic or dolimitic limestone |
| **CH** | Chalk | **FSST** | Soft, fine grained sandstone |
| **ZR.** | Soft, argillaceous or silty rocks | **GH** | Gravel with non porous (hard) stones |
| **MSST** | Soft, medium grained sandstone | **GS** | Gravel with porous (soft) stones |
| **SI** | Soft weathered igneous or metamorphic rock | | |

Stone contents are given in % by volume for sizes >2cm, >6cm and total stone >2mm.

**STRUCT** The degree of development, size and shape of soil peds are described using the following notation

| | | | | |
|---|---|---|---|---|
| **Degree of development** | **WK** | Weakly developed | **MD** | Moderately developed |
| | **ST** | Strongly developed | | |
| **Ped size** | **F** | Fine | **M** | Medium |
| | **C** | Coarse | **VC** | Very coarse |
| **Ped Shape** | **S** | Single grain | **M** | Massive |
| | **GR.** | Granular | **AB** | Angular blocky |
| | **SAB** | Sub-angular blocky | **PR.** | Prismatic |
| | **PL** | Platy | | |

**CONSIST** Soil consistence is described using the following notation

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **L** | Loose | **VF** | Very Friable | **FR.** | Friable | **FM** | Firm |
| **VM** | Very firm | **EM** | Extremely firm | **EH** | Extremely Hard | | |

**SUBS STR.** Subsoil structural condition recorded for the purpose of calculating profile droughtiness **G** Good **M** Moderate **P** Poor

**POR.** Soil porosity If a soil horizon has poor porosity with less than 0 5% biopores >0 5mm, a Y will appear in this column.

**IMP** If the profile is impenetrable to rooting a Y will appear in this column at the appropriate horizon

**SPL** Slowly permeable layer If the soil horizon is slowly permeable a Y will appear in this column

**CALC** If the soil horizon is calcareous with naturally occurring calcium carbonate exceeding 1% a Y will appear this column

**HORIZON BOUNDARY DISTINCTNESS**

| | | | |
|---|---|---|---|
| **Sharp** | <0 5cm | **Gradual** | 6 13cm |
| **Abrupt** | 0 5 2 5cm | **Diffuse** | >13cm |
| **Clear** | 2 5 6cm | | |

**HORIZON BOUNDARY FORM** Smooth, wavy irregular or broken.*

* See Soil Survey Field Handbook (Hodgson, 1974) for details

| SITE NAME | PROFILE NO | SLOPE AND ASPECT | LAND USE | | PARENT MATERIAL |
|---|---|---|---|---|---|
| Wells | Pit 1 (Asp 218) | 1 W | PGR | Av Rainfall 838mm<br>ATO 1529 day C | River terrace gravel |
| JOB NO | DATE | GRID REFERENCE | DESCRIBED BY | FC Days 186<br>Climatic Grade 1<br>Exposure Grade | SOIL SAMPLE REFERENCES |
| 13 96 | 23/5/96 | ST 53374419 | PB/HLJ | | HLJ 219 |

| Horizon No | Lowest Av Depth (cm) | Texture | Matrix (Ped Face) Colours | Stoniness Size Type and Field Method | Mottling Abundance Contrast, Size and Colour | Mangan Concs | Structure Ped Development Size and Shape | Consistence | Structural Condition | Pores (Fissures) | Roots Abundance and Size | Calcium Carbonate Content | Horizon Boundary Distinctness and form |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 20 | C | 10YR42 | 0% > 2cm<br>7% < 2cm<br>7% HR (S+D) | None | None | | | | | MF & UF | | Clear Smooth |
| 2 | 40 | C | 05YR54 | 15% > 2cm<br>25 % < 2cm<br>40% HR (S+D) | None | None | MMSAB | Friable | Good | Good | CM & F | | Gradual Smooth |
| 3 | 90 | C | 25YR46 | 30% > 2cm<br>37% < 2cm<br>67% HR (S+D) | None | None | Too Stony | Firm | Moderate | Good *1 | FM | | Diffuse Smooth |
| 4 | 100+ | C | 05YR63<br>25Y 63 | 40% Total (Vis) | None *2 | | Massive | Firm | Poor | Good *1 | None | | |

Profile Gleyed From Not Gleyed

Depth to Slowly Permeable Horizon No SPL

Wetness Class I

Wetness Grade 3b

| | | |
|---|---|---|
| Available Water | Wheat | 92 mm |
| | Potatoes | 77 mm |
| Moisture Deficit | Wheat | 101 mm |
| | Potatoes | 92 mm |
| Moisture Balance | Wheat | 9 mm |
| | Potatoes | 13 mm |
| Droughtiness Grade | 3a | (Calculated to 120 cm) |

Final ALC Grade 3b

Main Limiting Factor(s) Wk

Remarks *1 Few pores and compact, but fissures available and no evidence of wetness

*2 Variety of colours from various rotting stones

| SITE NAME | PROFILE NO | SLOPE AND ASPECT | LAND USE | | PARENT MATERIAL |
|---|---|---|---|---|---|
| Wells | Pit 2 (Asp 173) | 0 | Ley | Av Rainfall 862 mm<br>ATO 1511 day C<br>FC Days 193<br>Climatic Grade 1<br>Exposure Grade | Keuper Marl |
| JOB NO | DATE | GRID REFERENCE | DESCRIBED BY | | SOIL SAMPLE REFERENCES |
| 13 96 | 23 5 96 | ST 54494462 | PB/HLJ | | HLJ 218 |

| Horizon No | Lowest Av Depth (cm) | Texture | Matrix (Ped Face) Colours | Stoniness Size Type and Field Method | Mottling Abundance Contrast, Size and Colour | Mangan Concs | Structure Ped Development Size and Shape | Consistence | Structural Condition | Pores (Fissures) | Roots Abundance and Size | Calcium Carbonate Content | Horizon Boundary Distinctness and form |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 20 | HCL *1 | 10YR32 | 10 % HR (vis) | none | none | | | | Good | MF & VF | | Clear Smooth |
| 2 | 38 | C | 10YR33 | 15 % HR (vis) | none | none | MMSAB | Friable | Good | Good | FVF | | Clear Smooth |
| 3 | 45 | C | 05YR54 (05YR62,63) | 0 | CFFO G | Few | MF MAB | Firm | M | Good | FVF | | Clear Smooth |
| 4 | 80+ | C | 2 5YR54 05GY71 (2 5YR46) | 5% FSST (VIS) | none | none | MCAB *2 (Pr tendencies) | Firm | M | Poor | none | | |

Profile Gleyed From 38cm

Depth to Slowly Permeable Horizon 45cm

Wetness Class IV

Wetness Grade 4

| | | |
|---|---|---|
| Available Water | Wheat | 123 mm |
| | Potatoes | 115 mm |
| Moisture Deficit | Wheat | 101 mm |
| | Potatoes | 92 mm |
| Moisture Balance | Wheat | +22 mm |
| | Potatoes | +23 mm |

Droughtiness Grade 2 (Calculated to 100 cm)

Final ALC Grade 4

Main Limiting Factor(s) We

Remarks *1 TS felt gritty

*2 Various structure shape size and development but overall MCAB

| SITE NAME | PROFILE NO | SLOPE AND ASPECT | LAND USE | | PARENT MATERIAL |
|---|---|---|---|---|---|
| Wells | Pit 3 (Asp 190) | 2 South | Ley | Av Rainfall 862 mm<br>ATO 1511 day C | Head over Keuper Marl |
| JOB NO | DATE | GRID REFERENCE | DESCRIBED BY | FC Days 193<br>Climatic Grade 1<br>Exposure Grade | SOIL SAMPLE REFERENCES |
| 13 96 | 25/5/96 | ST 54044448 | PRW/HLJ | | |

| Horizon No | Lowest Av Depth (cm) | Texture | Matrix (Ped Face) Colours | Stoniness Size Type and Field Method | Mottling Abundance Contrast, Size and Colour | Mangan Concs | Structure Ped Development Size and Shape | Consistence | Structural Condition | Pores (Fissures) | Roots Abundance and Size | Calcium Carbonate Content | Horizon Boundary Distinctness and form |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | HZCL | 75YR32 | 15% > 2<br>17% < 2<br>32% HR (S+D) | None | None | | | Moderate | Many | MF VF M | | Clear Smooth |
| 2 | 56 | C | 5YR44 Ped Faces 5YR43 | 3% > 2<br>17% < 2<br>20% HR (S+D) | None | None | Moderate Coarse Subangular Blocky | Firm | Moderate | Poor | CF VF | | Clear Smooth |
| 3 | 80 | C | 05YR56/54 (05YR64) | 1% HR (vis) | None | None | MCAB | Firm | Moderate | Poor | | | |

Profile Gleyed From Not Gleyed

Depth to Slowly Permeable Horizon 56cm

Wetness Class III

Wetness Grade 3b

Available Water Wheat 118 mm

Potatoes 94 mm

Moisture Deficit Wheat 101 mm

Potatoes 92 mm

Moisture Balance Wheat 17 mm

Potatoes 2 mm

Droughtiness Grade 2 (Calculated to 120 cm)

Final ALC Grade 3b

Main Limiting Factor(s) Wetness

Remarks Pit augered to 120cm.

| SITE NAME | PROFILE NO | SLOPE AND ASPECT | LAND USE | | PARENT MATERIAL |
|---|---|---|---|---|---|
| Wells | Pit 5 (Asp 132) | 1 North | PGR | Av Rainfall 862 mm<br>ATO 1511 day C<br>FC Days 193<br>Climatic Grade 1<br>Exposure Grade | Estuarine alluvium |
| JOB NO | DATE | GRID REFERENCE | DESCRIBED BY | | SOIL SAMPLE REFERENCES |
| 13/96 | 5/6/95 | ST 84784490 | HLJ/PRW | | |

| Horizon No | Lowest Av Depth (cm) | Texture | Matrix (Ped Face) Colours | Stoniness Size Type and Field Method | Mottling Abundance Contrast Size and Colour | Mangan Concs | Structure Ped Development Size and Shape | Consistence | Structural Condition | Pores (Fissures) | Roots Abundance and Size | Calcium Carbonate Content | Horizon Boundary Distinctness and form |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 28 | HCL | 7 5YR32 | <1% HR (vis) | None | None | | | | Good | CF + VF | | Abrupt Smooth |
| 2 | 65 | C | 05YR44 (05YR53) | 1% HR (vi ) | None | Common | MCSAB | Firm | Moderate | Poor *[1] | CF + VF | | Clear Smooth |
| 3 | 90+ | C | 05YR62/54 2 5YR54 | 25 % HR (vi ) | CDMO (75YR56) | Common | WACSAB | Firm | Poor | Poor | None *[2] | | |

Profile Gleyed From 28cm

Depth to Slowly Permeable Horizon 65cm

Wetness Class III

Wetness Grade 3b

| | | |
|---|---|---|
| Available Water | Wheat | 126 mm |
| | Potatoes | 114 mm |
| Moisture Deficit | Wheat | 101 mm |
| | Potatoes | 92 mm |
| Moisture Balance | Wheat | 25 mm |
| | Potatoes | 22 mm |

Droughtiness Grade 2 (Calculated to 120 cm)

Final ALC Grade 3b

Main Limiting Factor(s) Wetness

Remarks Augered to 120cm
*[1] H2 few large pores
*[2] H3 assessed as rootable although none seen

Water observed in H2 indicates that there is water movement. Also many roots and clearly moderately developed strucutre

| SITE NAME | PROFILE NO | SLOPE AND ASPECT | LAND USE | | PARENT MATERIAL |
|---|---|---|---|---|---|
| Wells | Pit 6 (Asp 157) | 1 W | PGR | Av Rainfall 862 mm<br>ATO 1511 day C | Keuper Marl |
| JOB NO | DATE | GRID REFERENCE | DESCRIBED BY | FC Days 193<br>Climatic Grade 1<br>Exposure Grade | SOIL SAMPLE REFERENCES |
| 13/96 | 5/6/96 | ST 55154476 | PRW/HLJ | | |

| Horizon No | Lowest Av Depth (cm) | Texture | Matrix (Ped Face) Colours | Stoniness Size Type and Field Method | Mottling Abundance Contrast, Size and Colour | Mangan Concs | Structure Ped Development Size and Shape | Consistence | Structural Condition | Pores (Fissures) | Roots Abundance and Size | Calcium Carbonate Content | Horizon Boundary Distinctness and form |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 18 | HCL | 7 5YR32 | 1% HR | None | Common | | | Moderate | Many | Many fine and v fine | | Clear Smooth |
| 2 | 38 | C | 7 5YR54 | 30 % HR in top 12cm of horizon | Common distinct medium ochreous | Common | Weak, Coarse Subangular Blocky | Very Firm | M | < 0 5% biopores | Many fine and v fine | | Gradual Wavy |
| 3 | 70 | C | 2 5YR44 (2 5YR43 ped) 5GY61 | None | Few distinct medium ochreous | Common | Weak Coarse Angular blocky | Very Firm | M | < 0 5% biopores | Few Fine and v fine | | |

Profile Gleyed From 38

Depth to Slowly Permeable Horizon 18

Wetness Class 4

Wetness Grade 4

| | | |
|---|---|---|
| Available Water | Wheat | 133 mm |
| | Potatoes | 109 mm |
| Moisture Deficit | Wheat | 101 mm |
| | Potatoes | 92 mm |
| Moisture Balance | Wheat | +32 mm |
| | Potatoes | +17 mm |

Droughtiness Grade 1 (Calculated to 70 cm)

Final ALC Grade 4

Main Limiting Factor(s) Wetness

Remarks

| SITE NAME | PROFILE NO | SLOPE AND ASPECT | LAND USE | | PARENT MATERIAL |
|---|---|---|---|---|---|
| Wells | Pit 8 (Asp 82) | Flat | PGR | Av Rainfall 862 mm<br>ATO 1511 day C<br>FC Days 193<br>Climatic Grade 1<br>Exposure Grade | Estuarine alluvium |
| JOB NO | DATE | GRID REFERENCE | DESCRIBED BY | | SOIL SAMPLE REFERENCES |
| 13/96 | 6/6/96 | ST 55174530 | HLJ/PRW | | PRW 139 |

| Horizon No | Lowest Av Depth (cm) | Texture | Matrix (Ped Face) Colours | Stoniness Size Type and Field Method | Mottling Abundance Contrast, Size and Colour | Mangan Concs | Structure Ped Development Size and Shape | Consistence | Structural Condition | Pores (Fissures) | Roots Abundance and Size | Calcium Carbonate Content | Horizon Boundary Distinctness and form |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 30 | HCL | 7 5YR42 | 1% HR (vis) | None | None | | | | Good | MF & VF | | Clear Smooth |
| 2 | 55 | MCL | 75YR44 | 10% HR > 2cm<br>18% HR < 2cm<br>28% Total (S&D) | None | None | WMSAB | Friable | Good | Good | CF & VF | | Clear Wavy |
| 3 | 85 | MCL | 05YR43 | 35% HR > 2cm<br>29% HR < 2cm<br>64% Total (S&D) | None | None | Too stony | | Moderate (assumed) | Good | FF & VF | | Clear Wavy |
| 4 | 110+ | LCS | 05YR44 | 55% HR Total (S&D) | None | None | Too stony | | Moderate (assumed) | Good | VFF & VF | | |

Profile Gleyed From Not gleyed

Depth to Slowly Permeable Horizon No SPL

Wetness Class I

Wetness Grade 3a

Available Water Wheat 109 mm

Potatoes 102 mm

Moisture Deficit Wheat 101 mm

Potatoes 92 mm

Moisture Balance Wheat +8 mm

Potatoes +10 mm

Droughtiness Grade 2 (Calculated to 120 cm)

Final ALC Grade 3a

Main Limiting Factor(s) Workability

Remarks Augered/prodded to 120cm.

| SITE NAME | PROFILE NO | SLOPE AND ASPECT | LAND USE | | PARENT MATERIAL |
|---|---|---|---|---|---|
| Wells | Pit 9 (Asp 111) | 0 | PGR | Av Rainfall 862 mm<br>ATO 1511 day C | Estuarine alluvium |
| JOB NO | DATE | GRID REFERENCE | DESCRIBED BY | FC Days 193<br>Climatic Grade 1<br>Exposure Grade | SOIL SAMPLE REFERENCES |
| 13/96 | 6/6/96 | ST 55234513 | HLJ/PRW | | PRW 140 |

| Horizon No | Lowest Av Depth (cm) | Texture | Matrix (Ped Face) Colours | Stoniness Size Type and Field Method | Mottling Abundance Contrast, Size and Colour | Mangan Concs | Structure Ped Development Size and Shape | Consistence | Structural Condition | Pores (Fissures) | Roots Abundance and Size | Calcium Carbonate Content | Horizon Boundary Distinctness and form |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 33 | HCL | 10YR32 | 1% HR (vis) | None | Common (at boundary) | | | | Good | MF & VF | | Gradual Smooth |
| 2 | 65+ | C | 10YR53 | 1 % HR (vis) | MDMO (10YR58) | Common | WCPr | Firm | Poor | Poor | FF & VF (Common to 45 cm) | | |

Profile Gleyed From 33 cm

Depth to Slowly Permeable Horizon 33 cm

Wetness Class IV

Wetness Grade 4

Available Water Wheat 129 mm

Potatoes 107 mm

Moisture Deficit Wheat 101 mm

Potatoes 92 mm

Moisture Balance Wheat 28 mm

Potatoes 15 mm

Droughtiness Grade 2 (Calculated to 120 cm)

Final ALC Grade 4

Main Limiting Factor(s) Wetness

Remarks Augered to 100cm

| SITE NAME | PROFILE NO | SLOPE AND ASPECT | LAND USE | | PARENT MATERIAL |
|---|---|---|---|---|---|
| Wells | Pit 10 (Asp 116) | 2 ° North | PGR | ^ Rainfall 862 mm<br>ATO 1511 day C<br>FC Days 193<br>Climatic Grade 1<br>Exposure Grade | Keuper Marl |
| JOB NO | DATE | GRID REFERENCE | DESCRIBED BY | | SOIL SAMPLE REFERENCES |
| 13/96 | 6/6/96 | ST 55904504 | HLJ/PB | | HLJ 217 |

| Horizon No | Lowest Av Depth (cm) | Texture | Matrix (Ped Face) Colours | Stoniness Size Type and Field Method | Mottling Abundance Contrast, Size and Colour | Mangan Concs | Structure Ped Development Size and Shape | Consistence | Structural Condition | Pores (Fissures) | Roots Abundance and Size | Calcium Carbonate Content | Horizon Boundary Distinctness and form |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 28 | ZC | 7 5YR42 | 1/6 HR (vi ) | None | None | | | | Good | MF + VF | | Clear Irregular |
| 2 | 55 | C | 2 5YR44 05GY61 | < 1 / HR (vi ) | None | Common (down to 31cm) *[1] | MCAB (breaking from WCPr) | Firm | M | Poor | CF + VF | | Gradual Smooth |
| 3 | 80*[2] | C | 2 5YR44 05GY61 (05YR43) | < 1/6 HR (vis) | None | Common | MCAB | Very Firm | M | Poor | FF +VF | | |

| | | |
|---|---|---|
| Profile Gleyed From | No Gleying | |
| Depth to Slowly Permeable Horizon | 55 cm | |
| Wetness Class | III | |
| Wetness Grade | 4 | |
| Available Water | Wheat | 140 mm |
| | Potatoes | 117 mm |
| Moisture Deficit | Wheat | 101 mm |
| | Potatoes | 92 mm |
| Moisture Balance | Wheat | +39 mm |
| | Potatoes | +25 mm |
| Droughtiness Grade | 1 | (Calculated to 120 cm) |
| Final ALC Grade | 4 | |
| Main Limiting Factor(s) | Wetness | |

Remarks *[1] Plough pan? Therefore H2 not considered SPL because no signs of wetness
*[2] augered to 120cm

| SITE NAME | PROFILE NO | SLOPE AND ASPECT | LAND USE | | | PARENT MATERIAL |
|---|---|---|---|---|---|---|
| Wells | Pit 4 (Asp 72 73) | 2 South | PGR | Av Rainfall | 854 mm | Keuper Marl |
| | | | | ATO | 1517 day C | |
| JOB NO | DATE | GRID REFERENCE | DESCRIBED BY | FC Days | 190 | SOIL SAMPLE REFERENCES |
| 13 96 | 4/6/96 | ST 5261 4531 | PB/HLJ | Climatic Grade | 1 | PB 368 |
| | | | | Exposure Grade | | |

| Horizon No | Lowest Av Depth (cm) | Texture | Matrix (Ped Face) Colours | Stoniness Size, Type and Field Method | Mottling Abundance Contrast, Size and Colour | Mangan Concs | Structure Ped Development Size and Shape | Consistence | Structural Condition | Pores (Fissures) | Roots Abundance and Size | Calcium Carbonate Content | Horizon Boundary Distinctness and form |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 22 | ZC | 7 5YR32 | 0% | FRRC | None | | | | Good | MF VF | | Clear Smooth |
| 2 | 54 | C | 2 5YR34 | 1% HR | 0 | F | MCSAB | Fr | M | P but good fissures and few large pores therefore G overall | CF VF | | Diffuse Smooth |
| 3 | 80+ | C | 2 5YR46 | 0% | 0 | F | MCAB with Pr tendencies | Fm | M | P | FVF mainly exped | | |

Profile Gleyed From: Not gleyed

Depth to Slowly Permeable Horizon: No SPL

Wetness Class: I

Wetness Grade: 3b

| | | |
|---|---|---|
| Available Water | Wheat | 140 mm |
| | Potatoes | 116 mm |
| Moisture Deficit | Wheat | 101 mm |
| | Potatoes | 92 mm |
| Moisture Balance | Wheat | +39 mm |
| | Potatoes | +24 mm |

Droughtiness Grade 1 (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): wk

Remarks: Pit dug to 80cm, augered to 115m in H3
H3 secondary structure MCAB

| SITE NAME | PROFILE NO | SLOPE AND ASPECT | LAND USE | | PARENT MATERIAL |
|---|---|---|---|---|---|
| Wells | Pit 7 (Asp163) | 2 E | PGR | Av Rainfall 854 mm<br>ATO 1517 day C<br>FC Days 190<br>Climatic Grade 1<br>Exposure Grade | Keuper Marl |
| JOB NO | DATE | GRID REFERENCE | DESCRIBED BY | | SOIL SAMPLE REFERENCES |
| 13/96 | 5/6/96 | ST 53064462 | PB/PRW | | PB 369 |

| Horizon No | Lowest Av Depth (cm) | Texture | Matrix (Ped Face) Colours | Stoniness Size Type and Field Method | Mottling Abundance Contrast, Size and Colour | Mangan Concs | Structure Ped Development Size and Shape | Consistence | Structural Condition | Pores (Fissures) | Roots Abundance and Size | Calcium Carbonate Content | Horizon Boundary Distinctness and form |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 22 | ZC | 7 5YR33 | 1% HR | None | None | | | Moderate | Many | Many fine and VF | | Clear Smooth |
| 2 | 37 | C | 5YR43 | 1% HR | None | < 1% (few) | Weak medium & coarse prismatic | Very Firm | Poor | < 0 5% biopores | Common fine & VF (exped) | | Clear Smooth |
| 3 | 67 | C | 5YR44 (+25Y71) | 15% FSST | None | Very few | Weak fine subangular blocky | Very firm | Poor | < 0 5% biopores | Few fine & VF | | Clear Smooth |
| 4 | 90+ | C | 5YR46 | None | None | Few | Weak fine subangular blocky | Very firm | Poor | < 0 5% biopores (earth worm channels) | Few fine & VF | | |

Profile Gleyed From: Not gleyed

Depth to Slowly Permeable Horizon: No SPL though with more manganese the 3 lower horizons could be SPLS

Wetness Class: 1

Wetness Grade: 3b

Available Water: Wheat 122 mm; Potatoes 98 mm

Moisture Deficit: Wheat 101 mm; Potatoes 92 mm

Moisture Balance: Wheat +21 mm; Potatoes +6 mm

Droughtiness Grade 2 (Calculated to 120 cm)

Final ALC Grade: 3b

Main Limiting Factor(s): Wetness

Remarks: Horizon 2 not considered SPL apart from thickness because common rooting & signs of water movement (cutans) Similarly Horizon 3 shows very few signs of wetness

| SITE NAME | PROFILE NO | SLOPE AND ASPECT | LAND USE | | | PARENT MATERIAL |
|---|---|---|---|---|---|---|
| Wells | Pit 11 (Asp 53) | 3 S | PGR | Av Rainfall | 854 mm | Keuper Marl |
| | | | | ATO | 1517 day C | |
| JOB NO | DATE | GRID REFERENCE | DESCRIBED BY | FC Days | 190 | SOIL SAMPLE REFERENCES |
| 13/96 | 6/6/96 | ST 53384558 | HLJ/PRW | Climatic Grade | 1 | HLJ 216 |
| | | | | Exposure Grade | | |

| Horizon No | Lowest Av Depth (cm) | Texture | Matrix (Ped Face) Colours | Stoniness Size Type and Field Method | Mottling Abundance Contrast Size and Colour | Mangan Concs | Structure Ped Development Size and Shape | Consistence | Structural Condition | Pores (Fissures) | Roots Abundance and Size | Calcium Carbonate Content | Horizon Boundary Distinctness and form |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 28 | ZC/ HZCL | 75YR42/ 43 | 1 / HR ( ss) | None | None | | | | Good | CF + VF | | Gradual Smooth |
| 2 | 56 | C | 2 5YR44 (5YR43) + 05GY61 | 5% HR (vs ) | None | Few at top of horizon | Moderate coarse angular blocky | Very firm | Poor | < 0 5% biopores | Few fine & VF | | Gradual Smooth |
| 3 | 90 | C | 2 5YR44 (5YR43) + 059Y61 | 1 % HR | None | Common | Moderate coarse angular blocky | Very firm | Poor | < 0 5% biopores | V few fine and V fine | | |

Profile Gleyed From Not Gleyed

Depth to Slowly Permeable Horizon 56 cm

Wetness Class III

Wetness Grade 3b borderline 4

Available Water Wheat 126 mm

Potatoes 103 mm

Moisture Deficit Wheat 101 mm

Potatoes 92 mm

Moisture Balance Wheat +25 mm

Potatoes +11 mm

Droughtiness Grade 2 (Calculated to 120 cm)

Final ALC Grade 3b borderline 4

Main Limiting Factor(s) Wetness

Remarks H2 shows some Mn, possibly associated with a plough pan, but insufficient evidence of wetness to be SPL

H1 PSD ZC/HZCL but easily workable therefore topsoil texture taken as HZCL

| SITE NAME | PROFILE NO | SLOPE AND ASPECT | LAND USE | | PARENT MATERIAL |
|---|---|---|---|---|---|
| Wells | Pit12 (Asp 14) | 6 S | PGR | Av Rainfall 914 mm<br>ATO 1470 day C<br>FC Days 200<br>Climatic Grade 1<br>Exposure Grade | Dolomite limestone |
| JOB NO | DATE | GRID REFERENCE | DESCRIBED BY | | SOIL SAMPLE REFERENCES |
| 13 96 | 6 6 96 | ST 57434643 | PB | | PB 370 |

| Horizon No | Lowest Av Depth (cm) | Texture | Matrix (Ped Face) Colours | Stoniness Size Type and Field Method | Mottling Abundance Contrast, Size and Colour | Mangan Concs | Structure Ped Development Size and Shape | Consistence | Structural Condition | Pores (Fissures) | Roots Abundance and Size | Calcium Carbonate Content | Horizon Boundary Distinctness and form |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 15 | HZCL | 05YR43 | 2% > 2 cm<br>2% < 2 cm<br>4% HR (S+D) | 0 | 0 | | | | | MF VF | | Clear smooth |
| 2 | 28 | ZC | 05YR44 | 6% > 2 cm<br>4% < 2 cm<br>10% HR (S+D) | 0 | 0 | WFSAB | Fr | G | G | CF VF | | Ab Wavy |
| 3 | 35 | C | 05YR46 | 70% HR (VIS) | 0 | 0 | Too Stony | | | | | Y | |

Profile Gleyed From

Depth to Slowly Permeable Horizon

Wetness Class

Wetness Grade

No evidence of wetness within 35cm

| | | |
|---|---|---|
| Available Water | Wheat | 77 mm |
| | Potatoes | 74 mm |
| Moisture Deficit | Wheat | 101 mm |
| | Potatoes | 92 mm |
| Moisture Balance | Wheat | 24 mm |
| | Potatoes | 18 mm |
| Droughtiness Grade | 3b | (Calculated to 100 cm) |

Final ALC Grade 3b

Main Limiting Factor(s) Dr Wk

Remarks TS to 25 cm PSD ZC

| SITE NAME | PROFILE NO | SLOPE AND ASPECT | LAND USE | | PARENT MATERIAL |
|---|---|---|---|---|---|
| Wells | Pit13 (Near Asp 5) | 3 S | Ley | Av Rainfall 964 mm<br>ATO 1405 day C<br>FC Days 207<br>Climatic Grade 1<br>Exposure Grade | Burrington oolite |
| JOB NO | DATE | GRID REFERENCE | DESCRIBED BY | | SOIL SAMPLE REFERENCES |
| 13 96 | 6 6 96 | ST 57434671 | PB | | PB 371 |

| Horizon No | Lowest Av Depth (cm) | Texture | Matrix (Ped Face) Colours | Stoniness Size Type and Field Method | Mottling Abundance Contrast, Size and Colour | Mangan Concs | Structure Ped Development Size and Shape | Consistence | Structural Condition | Pores (Fissures) | Roots Abundance and Size | Calcium Carbonate Content | Horizon Boundary Distinctness and form |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 14 | HZCL | 10YR42 | 1% > 2 cm<br>4% < 2 cm<br>5 % HR (S+D) | 0 | 0 | | | | | MF VF | Y | Clear smooth |
| 2 | 32 | C | 10YR54 | 40% > 2 cm<br>8% < 2 cm<br>48% HR (S+D) | 0 | 0 | MFSAB | Fr | G | (G) | CF VF | Y | Clear Wavy |
| 3 | 48+ | C | 10YR54 | 90% HR (VIS) | 0 | 0 | Too Stony | | | (G) | CF VF * | Y | |

Profile Gleyed From

Depth to Slowly Permeable Horizon

Wetness Class

Wetness Grade

No evidence of wetness within 48cm

| | | |
|---|---|---|
| Available Water | Wheat | 53 mm |
| | Potatoes | 54 mm |
| Moisture Deficit | Wheat | 101 mm |
| | Potatoes | 92 mm |
| Moisture Balance | Wheat | -48 mm |
| | Potatoes | 38 mm |
| Droughtiness Grade | 3b | (Calculated to 80 cm) |

Final ALC Grade 3b

Main Limiting Factor(s) Dr Wk

Remarks * H3 roots common/many between stones
TS to 25 cm PSD ZC